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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/784,932	02/25/2004	Kazuo Nakajima	249420US2	9577

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EXAMINER

OLSEN, KAJ K

ART UNIT PAPER NUMBER

1753

DATE MAILED: 10/24/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

# Office Action Summary

Application No.

10/784,932

Applicant(s)

NAKAJIMA ET AL.

Examiner

Kaj K. Olsen

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

## Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

## Status

- 1) ☒ Responsive to communication(s) filed on 07 July 2006.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

## Disposition of Claims

- 4) ☒ Claim(s) 1-5,9,11,12 and 15 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-5,9,11,12,15 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

## Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

## Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
  - ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

## Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO/SB/08)  
Paper No(s)/Mail Date \_\_\_\_\_
- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_\_
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: \_\_\_\_\_

**DETAILED ACTION**

***Claim Rejections - 35 USC § 112***

1. The examiner is withdrawing outstanding 112 rejections in view of the amendment to claims 5 and 15 and the cancellation of claim 8.

***Claim Rejections - 35 USC § 103***

2. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.
3. Claims 1-5, 9, 11, 12, and 15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Nakajima et al (USP 2002/0139416 A1) in view of Saidov et al (Technical Physics Letters, 27, 2001, pp. 319-322) or Chan et al (Materials Letters 14, 1992, pp. 263-267). Both Saidov and Chen are being cited for the first time with this office action.
4. Alternatively, claims 1-5, 9, 11, 12, and 15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Saidov or Chan in view of Nakajima.
5. With respect to claims 1-3, Nakajima et al prepares the instant multi-element polycrystal of having the instant discrete regions dispersed in a matrix (see paragraphs 0009 to 0021, 0031, 0033, and 0034; and Figures 1A to 1D and 2A to 2D). In particular, it is the Examiner's position that the instant multi-element polycrystals prepared according to the procedure and cooling rate in paragraphs 0033 and 0034 and resultant microscopic distributions in Figures 1A to 1D and textures seen in respective Figures 2A to 2D inherently meet the claimed limitation that  $X_1 < X < X_2$ .

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6. With respect to the now claimed relationship that  $X \leq 0.1$ , Nakajima discloses only the broadly defined range of X between 0 and 1. For the purpose of examination (and in view of Applicant's filed declaration), the examiner will interpret this recitation as not having sufficient specificity to render obvious alone the particular use of  $X \leq 0.1$ . However, the use of  $\text{Si}_{1-x}\text{Ge}_x$  structures having a low X values has been well demonstrated in the solar cell art. Saidov teaches that  $\text{Si}_{1-x}\text{Ge}_x$  structures having low X values (including the specific examples of 0.05 and 0.10) have lower photosensitivity boundaries in comparison with the  $X=0.50$ . See the table on p. 321. Chan teaches that low X values (including particular examples of  $X=0.03$ ) are desired for  $\text{Si}_{1-x}\text{Ge}_x$  structures also give a desired lower photosensitivity boundary (i.e. bandgap reduction) and also allows for thicker grown strained layers. See p. 263, first paragraph and fig. 1 and 2. It would have been obvious to one of ordinary skill in the art at the time the invention was being made to utilize the claimed low X values, as demonstrated by Saidov and Chan, for the unspecified X values of Nakajima so as to arrive at a  $\text{Si}_{1-x}\text{Ge}_x$  polycrystal having reduced bandgaps or and increased strain in comparison with the explicitly demonstrated higher Ge concentration of Nakajima.

7. With respect to claim 4, the crystal grains are columnar shape (see Figures 2A to 2D where there are discrete regions three dimensionally dispersed in a matrix (see Figures 2A to 2D). It is the Examiner's position that the matrices in Nakajima et al's Figures 2A to 2D have strain.

8. With respect to claim 5, a solar cell is manufactured (see paragraphs 0014, 0019, and 0039).

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9. With respect to claims 9 and 12 (those limitations not covered above), Nakajima et al prepares a multi-element polycrystal, such as one containing Si and Ge, or one containing Ga, In and As in instant claim 9, by a method comprising preparing a melt containing multi elements; and cooling the melt while controlling a cooling rate to obtain a multi-element polycrystal (see paragraphs 0027, 0033, 0034; and claims 12 and 13. The composition of the melt is controlled since one selects the amounts of elements to be melted (see paragraph 0033). It is the Examiner's position that the resulting multi-element polycrystal has the instant discrete regions dispersed in a matrix (see Figures 2A to 2D; paragraphs 0022 to 0028; and paragraph 0033 which exemplifies the method of manufacture).

10. With respect to claim 11, Nakajima et al prepares said multi-element polycrystal,  $\text{Si}_{1-x}\text{Ge}_x$  by a method comprising preparing a melt containing multi elements; and cooling the melt while controlling a cooling rate melt to obtain a multi-element polycrystal (see paragraphs 0027, 0033, 0034; and claims 12 and 13. The composition of the melt is controlled since one selects the amounts of elements to be melted (see paragraph 0033). The resulting multi-element polycrystal has the instant discrete regions dispersed in a matrix (see Figures 2A to 2D; and paragraphs 0022 to 0028). As noted above, it is the Examiner's position that the instant multi-element polycrystals prepared according to the procedure with the cooling rate in paragraphs 0033 and 0034 and resultant microscopic distributions in Figures 1A to 1D and textures seen in respective Figures 2A to 2D inherently meet the claimed limitation that  $X_1 < X < X_2$ .

11. With respect to claim 15, a solar cell is manufactured (see paragraphs 0014, 0019, and 0039).

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12. In addition the instant requirement that  $X_1 < X < X_2$ , the instant strain, and the instant discrete regions dispersed in a matrix, would obviously have been present once the multi-element polycrystals prepared according to the procedure in Nakajima et al's paragraph 0033 and 0034 and resultant microscopic distributions in Figures 1A to 1D and textures seen in respective Figures 2A to 2D are prepared and with the particularly suggested compositions of Saidov and Chan.

13. With respect to the claims in the alternative, both Saidov and Chan disclosed the use of multi-element structures for solar cells that have an average  $\text{Si}_{1-x}\text{Ge}_x$  structure with  $x \leq 0.1$ . However, these references did not explicitly disclose all the other elements of the claims. However, Nakajima discloses a process for treating and preparing a  $\text{Si}_{1-x}\text{Ge}_x$  structure that does result in a structure that reads on the defined multi-element of the claims. See the discussion above and in the previous office action of 2-7-2006. This process of Nakajima results in a solar cell that has a longer range of photosensitivity in comparison with uniform compositions, like those of Saidov and Chan. See fig. 3 and paragraphs 0035 and 0036. It would have been obvious to one of ordinary skill in the art at the time the invention was being made to prepare the solar cell of Saidov and Chan in a manner set forth by Nakajima such that the resulting solar cell has an increased photosensitivity and increased efficiency.

### ***Response to Arguments***

14. Applicant's arguments filed 7-7-2006 have been fully considered but they are not persuasive. Applicant urges via arguments and declaration that applicant achieved unexpected results with a choice of  $x \leq 0.1$ . That may be true, but it has been well established that a patent

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cannot be granted for an applicant's discovery of a result, even though it may be unexpected good, which would have flown logically from the teaching of the prior art. In this particular case, Nakajima discloses a favorable structure and method that overlapped the claimed X range of the applicants, but did not specifically provide any examples in that claimed range. However, the newly cited prior art that one possessing ordinary skill in the art would have motivated to look to the specific composition range of claimed invention to derive favorable properties for the constructed solar cell. See the discussion above.

### *Conclusion*

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Kaj Olsen whose telephone number is (571) 272-1344. The examiner can normally be reached on Monday through Friday from 8:00 A.M. to 4:30 P.M..

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nam Nguyen, can be reached on 571-272-1342. The fax phone number for the organization where this application or proceeding is assigned is (571) 273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

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October 19, 2006

A handwritten signature in black ink, appearing to read 'Kaj K. Olsen', with a stylized, flowing script.

**KAJ K. OLSEN  
PRIMARY EXAMINER**